
Early predictions of hypoxic ischemic encephalopathy by umbilical cord nucleated red blood cells and lactate

Thesis

Submitted for partial fulfillment of Master Degree in
pediatrics

By

Eman Abdelwahed Abdelfatah
M.B.B.Ch.

SUPERVISORS

Dr. Laila Hussein Mohamed

Prof. of pediatrics
Cairo University

Dr.Samia Hassan Rezq

Prof. of clinical pathology
Cairo University

Dr.Nermin Ramy Mohamed

Lecturer of pediatrics
Cairo University

Cairo University

2010

ACKNOWLEDGMENT



Praise be to , the Merciful, the Compassionate for all countless gifts I have been offered one of these gifts is accomplishing this research work.

It gives me a great pleasure to express my deepest gratitude and cordial feeling to **Prof Dr LAILA HUSSIN MOHAMED**, Professor of Pediatrics Faculty of Medicine, Cairo University. Who devoted much of her precious time, effort and generous advice for the completion of this work. Many thanks to her experienced guidance and encouragement.

I am so grateful to **Dr. SAMIA HASSAN REZQ** Professor of Clinical pathology Faculty of Medicine, Cairo University. For her valuable help and guidance in the course of this research. Her sincere efforts will never be forgotten and I shall always remain indebted to her.

I would like to express my great thanks to **DR NERMIN RAMY MOHAMED**, Lecturer of Pediatrics Faculty of Medicine, Cairo University, for her continuous encouragement, help and support.

Special thanks to **DR Hanan Elhosiny**, lecturer of clinical pathology Faculty of Medicine, Cairo University, for her help in finishing this work.

Special thanks are given to Dr Nagy Elhossiny, fellow of pediatrics, Ahmed Maher teaching hospital, for his valuable cooperation to fulfill this work.

All my gratitude and sympathy should be conveyed to all my **Neonates** for allowing me to carry on this study and to **every one** gave a hand on this work.

Dedication

To my father, who gave me
everything I have.

To my mother, who is behind
all my achievements.

To my sisters, **Amal and Omnia**
who made my days to shine.

To my brother, **Ahmed** who
supported me in life
To all my Friends who helped
me.

APPENDIX

item	Page
List of tables	I
List of figures	IV
List of abbreviations	VI
Introduction	1
Aim of the work	2
Chapter one	3
Chapter two	43
Chapter three	49
Chapter four	55
Patients and methods	60
Results	64
Discussion	80
Summary	87
Recommendations	88
References	89
Arabic summary	114

LIST OF TABLES

No	item	page
Table 1	Apgar scoring system.	4
Table 2	Risk factors of neonatal encephalopathy.	6
Table 3	Sarnat and Sarnat scoring system.	20
Table 4	Miller scoring system	23
Table 5	Fetal heart rate patterns –major causes and usual significance	27
Table 6	Summary of potential neuroprotective strategies.	41
Table 7	Sex distribution among cases and controls.	63
Table 8	Comparison between cases and control according to weight and gestational age.	64

Table 9	Comparison between cases and control as regards Apgar score.	65
Table 10	Maternal risk factors of the studied group.	65
Table 11	Maternal obstetric history of the studied group.	66
Table 12	Neurological examination of the cases.	67
Table 13	Correlation between grades of hypoxia with mode of delivery, maternal risk factors and maternal obstetric history.	70
Table 14	Outcome of the studied and control group.	70
Table 15	Outcome of patient group according to grades of hypoxia.	71
Table 16	Comparison between cases and control group as regarding nucleated red blood cells and serum lactate level.	72
Table 17	To assess cut -off of NRBCs and serum lactate level in detecting hypoxia.	74

Table 18	Comparison between the three grades of hypoxia as regarding nucleated red blood cells and serum lactate level.	75
Table 19	Comparison between grade I and grade II of hypoxia in relation to NRBCs and serum lactate level.	76
Table 20	Comparison between grade II and grade III of hypoxia in relation to nucleated red blood cell and Lactate.	78

LIST OF FIGURES

No	Item	Page
Figure (1)	Fetal response to asphyxia	9
Figure (2)	Cellular mechanisms of hypoxic ischemic brain damage	15
Figure(3)	Parasagittal cortex and subcortical white matter brain injury in a term (38 weeks gestation) infant with a history of birth asphyxia, show mild hyper intense T2 signal and restricted diffusion (*) in the parasagittal cortex and subcortical white matter in both occipital lobes.	32
Figure(4)	Mixed pattern of injury in a term (42 weeks gestation) infant delivered by emergency cesarean section due to late deceleration on fetal monitoring and who developed severe hypotension. (a) Axial CT scan obtained on day 1 of life shows subtle bilateral hypoattenuation of the basal ganglia and thalami, which are isoattenuated compared with surrounding white matter.	34

Figure(5)	A represent blood smear of maternal blood, B represent blood smear of fetal blood, arrows represent nRBCs.	44
Figure(6)	mode of delivery in patient and control group	64
Figure(7)	Classification of cases according to grades of hypoxia.	68
Figure (8)	Outcome in both patients and control group	71
Figure(9)	Receiver Operating Characteristic (ROC) curve to define the best cutoff to detect hypoxia.	73
Figure(10)	Receiver Operating Characteristic (ROC) curve to define the best cutoff to differentiate between degree of hypoxia; grade I and II.	76
Figure(11)	Receiver Operating Characteristic (ROC) curve to define the best cutoff to differentiate between degree of hypoxia; grade II and III.	77

LIST OF ABBREVIATIONS

AAP	American colleague of pediatrics.
ABE	Actual base excess.
ABG	Arterial blood gases.
ACOG	American colleague of obstetric and gynecology.
AEEG	Amplitude-integrated electroencephalography.
ADH	Antidiuretic hormone.
AFV	Amniotic fluid volume.
ALT	Alanine aminotransferase
AST	Aspartate aminotransferase.
ATN	Acute tubular necrosis.
ATP	Adenosyle triphosphate.
BD	Base deficit.
BE	Base excess.
BP	Blood pressure.
BPP	Biophysical profiles.
BUN	Blood urea level.
Ca	Calcium.
CBF	Cerebral blood flow.
CK	Creatine kinase.